

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/26132

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : F16F 9/38; F16L 57/00
US CL : 188/322.12; 267/64.11; 118/505

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U.S. : 188/322.12,382; 267/64.11; 118/505,504; 16/66,67,68; 383/70,71,77,84,85,88; 206/315.1,811

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
USPTO, PGPUB, USOCR, EPO, JPO, DERWENT

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 3,042,796 A (De FOREST) 03 July 1962 (03.07.1962), figure 1, column 2 lines 20-29.	1 and 4
---		-----
A		5 and 8
Y	US 3,850,141 A (SCHMITT) 26 November 1974 (26.11.1974), whole document.	1-4
---		-----
A		5-8
Y	US 4,591,137 A (STEINBERG) 27 May 1986 (27.05.1986), whole document.	1-4
---		-----
A		5-8
Y	US 5,074,390 A (FUHRMANN et al) 24 December 1991 (24.12.1991), whole document.	1-4
---		-----
A		5-8

Further documents are listed in the continuation of Box C.

See patent family annex.

Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier application or patent published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means		
"P" document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search

05 May 2005 (05.05.2005)

Date of mailing of the international search report

17 JUN 2005

Name and mailing address of the ISA/US
Mail Stop PCT, Attn: ISA/US

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Facsimile No. (703) 305-3230

Authorized officer

S. Williams
Thomas J. Williams

Telephone No. 571-272-6584

INTERNATIONAL SEARCH REPORTInternational application No.
PCT/US04/26132**C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6,334,711 B1 (RISGALLA et al) 01 January 2002 (01.01.2002), column 3 lines 63-66.	2 and 3
--		-----
A		6 and 7
Y	FR 2636404 A (BUISSON) 16 March 1990 (16.03.1990), abstract and figures 7 and 17.	1 and 4
--		-----
A		5 and 8
A	US 4,372,429 A (MARX) 08 February 1983 (08.02.1983).	1-8
A	US 4,921,028 A (SCHWARTZ) 01 May 1990 (01.05.1990).	1-8
A	US 5,791,445 A (KAUFMANN et al) 11 August 1998 (11.08.1998).	1-8

BEST AVAILABLE COPY